Comments and Communications

Natural Vegetation in the Willamette Valley

The letter from J. E. Smith on "Natural Vegetation in the Willamette Valley, Oregon" (*Science*, 1949, **109**, 42) clearly points out the need for historical records in ecological studies. In the Nisqually River drainage area south of the city of Tacoma, Washington, the vegetation type map shows extensive areas of young Douglas fir forest. Much of this originally was prairie grassland, according to records of the early settlers. In less than a century the prairies have changed to forest, after rather heavy grazing by domestic livestock. Previously the prairie was only lightly grazed by game animals, and occasional flash fires kept the brush and conifers out.

To the southwest, below Tenino, lies the section of this old prairie country in which the Mima mounds thickly dot the landscape. Numerous interesting theories to account for their formation have been put forth. They have been attributed to eddy currents at the time the area was submerged beneath Puget Sound, to surface erosion under peculiar conditions, to the work of Indian tribes, to ant hills, to glacial action, etc. Victor B. Scheffer, in "The Mystery of the Mima Mounds" (*The Scientific Monthly*, 1947, 65, 283), proposes the theory that they were built by families or colonies of pocket gophers. While his evidence is indirect, he makes a reasonable development. Proponents of the glacier action source hold that no gopher ever carried big stones uphill, and point to the presence of rounded stones and boulders in the upper parts of the mounds. And so it goes. Here a geologically long historical record is needed to settle the matter.

Sometimes reconstructions from fossil records tell the story. R. W. Chaney brings this out very nicely in *Ancient forests of Oregon: A study of earth history in Western America*. Recent ecological studies by other scientists show the present stage of vegetation; the paleobotanical studies demonstrate its development. Ecology, to explain its present findings properly, generally must depend on indisputable interpretation of related evidence from the past.

Portland, Oregon W. E. BULLARD

Thermal Coefficient of the Refractive Index of Water

A recent technical paper by Antonoff and Conan (*Science*, 1949, **109**, 255) reports a discontinuity in the thermal expansion coefficient of water near 50.5° C. We have been measuring, by a direct method (Hawkes, J. B. and Astheimer, R. W., *J. Opt. Soc. Amer.*, 1948, **38**, 617), the thermal coefficient of the index of refraction of water up to 53° C. Continuous observation (i.e. fringe counting) is inherent in the method, so that we have left no unobserved points in this neighborhood.

The well-known relation between refractive index and density,

$$P = \frac{1}{d}\left[\frac{n^2-1}{n^2+2}\right],$$

can be used to interpret the results for the density, found by Antonoff and Conan, in terms of the thermal coefficient of the index, which we have measured. Results are given in Table 1, with P (above) as 0.20616 cgs units.

TABLE 1

T (°C)	Estimated from Antonoff & Conan		Observed
	$\frac{d(d)}{dT} \times 10^4$	$\frac{dn}{dT} \times 10^4$	$\frac{dn}{dT} \times 10^4$
49	− 4.9	− 1.80	− 1.64
50	− 5.7	− 2.09	− 1.66
	− 6.0	− 2.20	
50.5			− 1.67
	− 3.0	− 1.10	
51	− 3.6	− 1.32	− 1.68
52	− 4.4	− 1.61	− 1.70

These values are plotted in Fig. 1. The Antonoff and Conan values are estimated from their published curve; those of Hawkes and Astheimer by observations.

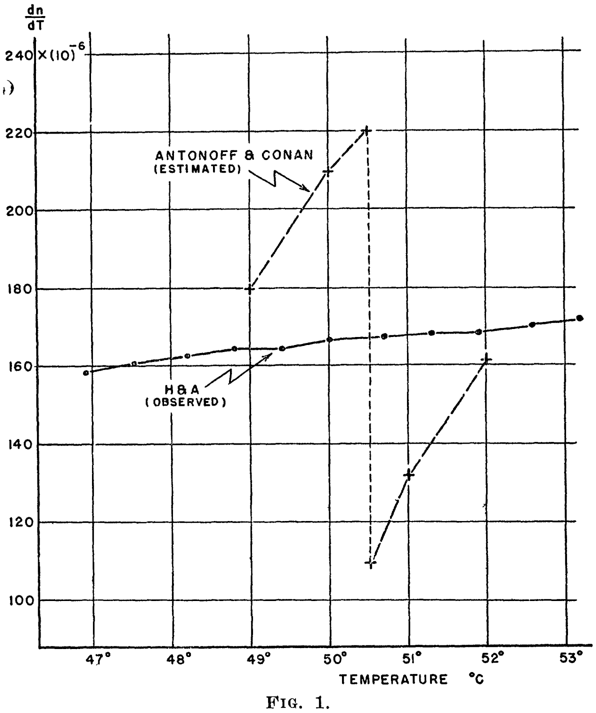

FIG. 1.

If the density of water does behave with temperature as reported by Antonoff and Conan, and if our results on the thermal coefficient of the refractive index are correct, there must be a precisely compensating discontinuity in the value of the Lorentz constant, P, at 50.5° C.

JOHN B. HAWKES and ROBERT W. ASTHEIMER
Stevens Institute of Technology, Hoboken, New Jersey